

I claim:

1 1. A laser beam ophthalmological surgery method  
2 for treating presbyopic in a patient's eye by ablating  
3 the sclera comprising the steps of :  
4 selecting a pulsed ablation laser having a pulsed  
5 output beam of predetermined wavelength and an energy  
6 per pulse of between 0.1 - 5 mJ on the surface of the  
7 cornea;  
8 selecting a beam spot controller mechanism for  
9 reducing and focusing said selected ablative laser's  
10 output beam onto a predetermined spot size on the  
11 surface of the cornea;  
12 selecting a scanning mechanism for scanning said  
13 ablative laser output beam;  
14 coupling said ablative laser beam to a scanning  
15 device for scanning said ablative laser over a  
16 predetermined area of the corneal sclera; and  
17 controlling said scanning mechanism to deliver  
18 said ablative laser beam in a predetermined pattern in  
19 said predetermined area onto the surface of the  
20 cornea to photoablate the sclera, whereby a presbyopic  
21 patient's vision is corrected by expansion of the  
22 sclera.

1 2. A laser beam ophthalmological surgery method  
2 for treating presbyopic in a patient's eye by ablating  
3 the sclera in accordance with claim 1 in which the  
4 step of selecting a pulsed ablation laser includes  
5 selecting a pulsed ablative laser having a  
6 predetermined wavelength between 0.15 - 0.32 microns.

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1           3. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 1 in  
4 which the step of selecting a pulsed ablation laser  
5 includes selecting a pulsed ablative laser having a  
6 wavelength between 2.6 and 3.2 microns.

1           4. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 1 in  
4 which the step of selecting a pulsed ablation laser  
5 includes selecting a Q-switched solid state laser  
6 having a pulse duration shorter than 200 nanoseconds.

1           5. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 1 in  
4 which the step of selecting a pulsed ablation laser  
5 includes selecting a pulsed gas laser having a pulse  
6 duration shorter than 200 nanoseconds.

1           6. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 1 in  
4 which said the step of selecting a beam spot  
5 controller includes selecting a pulsed ablative laser  
6 having a focusing lens with focal length of between  
7 10 and 100 cm selected to obtain a predetermined laser  
8 beam spot size having a diameter of between 0.1 and  
9 0.8 mm on the corneal surface.

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1           7. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by 6g  
3 ablating the sclera in accordance with claim 1 in  
4 which the step of selecting a beam spot controller  
5 includes selecting beam spot controller having a  
6 focusing lens with cylinder focal length of between 10  
7 and 100 cm to obtain a laser beam spot having a line  
8 size of about 0.1-0.8 mm x 3-5 mm on the corneal  
9 surface.

1           8. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 1 in  
4 which the step of selecting a scanning mechanism  
5 includes selecting a scanning mechanism having a pair  
6 of reflecting mirrors mounted to a galvanometer  
7 scanning mechanism for controlling said laser output  
8 beam into a predetermined overlapping pattern.

1           9. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 ablating the sclera in accordance with claim 8 in  
4 which the step of selecting said scanning mechanism  
5 includes selecting a scanning mechanism having an  
6 overlapping pattern overlapping from 20 to 80% within  
7 the selected area of the sclera.

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11. A laser beam ophthalmological surgery method for treating presbyopic in a patent's eye by ablating the sclera in accordance with claim 10 including the steps of:

- 5           selecting a metal mask having at least on
- 6           slit therein; and
- 7           positioning the selected mask over the
- 8           cornea surface for scanning the ablation laser and
- 9           the coagulative laser thereover for controlling the
- 10          ablation slit pattern on the sclera.

1           12. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue including  
5 the steps of:

6           selecting an ablation laser having an output  
7 beam of predetermined wavelength for ablating the  
8 surface of the cornea;

9           ablating a predetermined area of the cornea  
10 sclera with the output beam from said ablation laser;

11           selecting a coagulative laser having an  
12 pulsed output beam of predetermined wavelength having  
13 an average power of between 20-3000 mW on the surface  
14 of the cornea;

15           selecting a beam spot controller mechanism for  
16 reducing and focusing said coagulative laser beam to  
17 a predetermined spot size on the corneal surface;

18           selecting a scanner for scanning said  
19 coagulative laser output beam;

20           coupling said coagulative laser beam onto a  
21 scanner for scanning said coagulative laser beam over  
22 a predetermined area of the corneal sclera which has  
23 been ablated by said ablation laser;

24           controlling the scanner to deliver said  
25 coagulative laser output beam in a predetermined  
26 pattern onto a plurality of positions on the corneal  
27 surface to coagulate the ablated areas of the sclera,  
28 whereby bleeding in said ablated tissue is reduced by  
29 the said coagulation laser beam.

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1 13. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said predetermined  
6 wavelength is between 0.5 and 3.2 microns.

1 14. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said predetermined  
6 wavelength is between 5.5-10.6 microns.

1 15. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said coagulative  
6 laser is a continuous wave laser.

1 16. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said selected  
6 coagulative laser is a long pulse laser having a pulse  
7 duration longer than 200 nanoseconds.

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1 17. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said step of  
6 selecting a beam spot controller includes selecting a  
7 focusing lens having a focal length of between 10 and  
8 100 cm. to obtain a predetermined laser beam spot size  
9 having a diameter between 0.2-2.0 mm on the corneal  
10 surface.

1 18. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said selecting  
6 beam spot controller includes a focusing lens having  
7 a focal length of between 10 and 100 cm selected to  
8 obtain a predetermined laser beam spot having a line  
9 size of about 0.2-2.0 x 3-5 mm on the corneal  
10 surface.

1 19. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which the step of  
6 selecting a scanning mechanism includes selecting a  
7 scanning mechanism having a pair of reflecting mirrors  
8 mounted to a galvanometer scanner for controlling said  
9 coagulative laser output beam into an overlapping  
10 pattern following said ablative laser output beam  
11 ablating surface tissue on the corneal surface.

1           20. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 19 in which said overlapping  
6 pattern includes an overlap of between 20 and 80% in  
7 a pattern defined on the corneal surface by said  
8 ablative laser.

1           21. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said ablative laser  
6 has a wavelength between 0.5-3.2 microns and a pulse  
7 width shorter than 200 nanoseconds delivered to the  
8 surface of the cornea by an optical fiber.

1           22. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patent's eye by  
3 coagulating sclera tissue ablated with an ablating  
4 laser beam to prevent bleeding in the tissue in  
5 accordance with claim 12 in which said selected  
6 coagulative laser has a wavelength of between 0.5-10.6  
7 microns, and a pulse width longer than 200 nanoseconds  
8 delivered to the surface of the cornea by an optical  
9 fiber to prevent tissue bleeding.

CONFIDENTIAL



23. A laser beam ophthalmological surgery method for treating presbyopic in a patent's eye by coagulating sclera tissue expanded by a knife to prevent bleeding in the tissue including the steps of:

- cutting a predetermined area of the cornea sclera with a knife;
- selecting a coagulative laser having an pulsed output beam of predetermined wavelength having an average power of between 20-3000 mW on the surface of the cornea;
- selecting a beam spot controller mechanism for reducing and focusing said coagulative laser beam to a predetermined spot size on the corneal surface;
- selecting a scanner for scanning said coagulative laser output beam;
- coupling said coagulative laser beam onto a scanner for scanning said coagulative laser beam over a predetermined area of the corneal sclera which has been cut with said knife;
- controlling the scanner to deliver said coagulative laser output beam in a predetermined pattern onto a plurality of positions on the corneal surface to coagulate the cut areas of the sclera, whereby bleeding in said cut tissue is reduced by the said coagulation laser beam.

1           24. A laser beam ophthalmological surgery  
2 method for treating presbyopic in a patient's eye by  
3 coagulating sclera tissue expanded by a knife to  
4 prevent bleeding in the tissue in accordance with  
5 claim 23 in which the selected coagulative laser has  
6 a wavelength of between 0.5 and 10.6 microns and a  
7 pulse width longer than 200 nanoseconds.

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